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Serial No.: 10/647829
Confirmation No.: 2942
Applicant: PATEL, Arvind D.
Atty. Ref.: PA-00409US

AMENDMENTS TO THE SPECIFICATION:

Applicant submits the following amendments to the specification:

(Page and line numbers are from the application as filed. Paragraph numbering is that from the published application US2005/0054539.)

Please amend the paragraph beginning on page 6, line 2 and ending on page 6, line 14 (i.e. paragraph [0023]) as follows:

The present invention includes a biodegradable wellbore fluid that includes a first synthetic internal olefin fraction having from 16 to 18 carbon atoms, a second synthetic internal olefin fraction having between 15 and 18 carbon atoms and a third synthetic internal olefin fraction having 15-16 carbon atoms. As the term is used in this disclosure a C_{16-18} ~~IO~~ internal olefin fraction is defined as having a C_{16} isomer content of greater than 50% w/w and a C18 isomer content greater than 30% w/w. As the term is used in this disclosure a C_{15-18} ~~IO~~ internal olefin fraction is defined as having a C_{15} isomer content of greater than 20% w/w; a C_{16} isomer content greater than 20%; a C_{17} isomer content greater than 20%; and a C_{18} isomer content greater than 15% w/w. As the term is used in this disclosure a C_{15-16} ~~IO~~ internal olefin fraction is defined as having a C_{15} isomer content of greater than 40% w/w and a C_{16} isomer content greater than 40% w/w. As the term is used in this disclosure a C_{16} alpha olefin is defined as having a C_{16} isomer content of greater than 90% w/w. The fluids may contain a mixture of isomers so long as the content of the other isomers does not exceed those of the isomers that define the fluid.

Please amend the paragraph beginning on page 6, line 15 and ending on page 6, line 23 (i.e. paragraph [0024]) as follows:

The components of the illustrative wellbore fluid are blended such that the desired characteristics of toxicity and biodegrability are balanced to achieve compliance with the base stock limitation requirements for discharge. One such illustrative embodiment achieves this result by utilizing a core blend formulation in which the first internal olefin fraction is present in

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a range up to 70 percent by volume of the wellbore fluid and wherein the second internal olefin fraction is present in range of up to 70 percent by volume of the wellbore fluid and wherein the third olefin fraction is present in range of up to 60 percent by volume of the wellbore fluid. In addition to the first core blend, variations of the base stock blend ratios and interpolations between these blends are also included in the present invention.

Please amend the paragraph beginning on page 10, line 18 and ending on page 11, line 17 (i.e. paragraph [0031]) as follows:

An oleaginous fluid is a liquid and more preferably is a synthetic material and more preferably the oleaginous fluid is selected from the group including synthetic internal olefin fractions, synthetic alpha olefin fractions and mixtures thereof. The concentration of the oleaginous fluid should be sufficient so that an invert emulsion forms and may be less than about 99% by volume of the non-aqueous drilling fluid emulsion. In one embodiment the amount of oleaginous fluid is from about 30% to about 95% by volume and more preferably about 40% to about 90% by volume of the non-aqueous drilling fluid. The oleaginous fluid in one embodiment includes a mixture of synthetic internal olefin fractions and in another alternative illustrative embodiment the mixture includes alpha fractions in addition to the mixture of synthetic internal fractions. As is illustrated below, such a combination of synthetic internal fractions and optionally alpha olefin results in a drilling fluid having a desirable balance of toxicity and biodegradability. Specifically, in one illustrative core blend embodiment a mixture of a synthetic C_{16}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{16} internal olefin fraction has been found to consistently meet the environmental standards for use in the Gulf of Mexico. This consistency of passing the toxicity and biodegradation tests provides a higher level of compliance assurance in contrast to the performance of the individual products which suffer greater variability due to testing artifacts and manufacturing inconsistencies. In another illustrative core blend embodiment, a mixture of a synthetic C_{16}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{16} internal olefin fraction and a C_{16} alpha olefin has been found to consistently meet the environmental standards for use in

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the Gulf of Mexico and Effluent Limitation Guidelines. This results in an oleaginous fluid having a balance of toxicity and biodegradability properties as well as meeting the PAH limitations required by the Effluent Limitation Guidelines and the general permits including GMG290000. Specifically, in the second illustrative core blend embodiment a mixture of a synthetic C_{16}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{16} internal olefin fraction and a C_{16} alpha olefin has been found to consistently meet the environmental standards for use in the Gulf of Mexico. This consistency of passing the toxicity and biodegradation tests provides a higher level of compliance assurance in contrast to the performance of the individual products which suffer greater variability due to testing artifacts and manufacturing inconsistencies.

Please amend the paragraph beginning on page 12, line 1 and ending on page 12, line 10 (i.e. paragraph [0033]) as follows:

In an illustrative embodiment of the present invention, three different internal olefin fractions (IO s) were tested and utilized: C_{16}-C_{18} internal olefin fraction (the first internal olefin fraction, also refered to as the $C_{16\text{-}18}$ IO), C_{15}-C_{18} internal olefin fraction (the second internal olefin fraction), and C_{15}-C_{16} internal olefin fraction (the third internal olefin fraction). Additionally, a C_{16} alpha-olefin fraction (AO) was tested and optionally was added to the mixture of internal olefins. As noted above, we have discovered that biodegradability generally increases in the following order: C_{16}-C_{18} internal olefin fraction; C_{15}-C_{18} internal olefin fraction; C_{15}-C_{16} internal olefin fraction; and C_{16} alpha-olefin fraction having the highest biodegradability. In contrast, testing of the toxicity generally has the opposite order with C_{16}-C_{18} internal olefin fraction having the lowest toxicity; C_{15}-C_{18} internal olefin fraction; C_{16} alpha-olefin fraction and C_{15}-C_{16} internal olefin fraction having the highest toxicity.

Please amend the paragraph beginning on page 12, line 19 and ending on page 13, line 5 (i.e. paragraph [0036]) as follows:

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As the term is used in this disclosure a C_{16-18} internal olefin fraction (the first internal olefin fraction, also referred to as the C_{16-18} IO) is defined as having a C_{16} isomer content of greater than 50% w/w and a C_{18} isomer content greater than 30% w/w. As the term is used in this disclosure a C_{15-18} internal olefin fraction (the second internal olefin fraction, also referred to as the C_{15-18} IO) is defined as having a C_{15} isomer content of greater than 20% w/w; a C_{16} isomer content greater than 20%; a C_{17} isomer content greater than 20%; and a C_{18} isomer content greater than 15% w/w. As the term is used in this disclosure a C_{15-16} internal olefin fraction (the third internal olefin fraction, also referred to as the C_{15-16} IO) is defined as having a C_{15} isomer content of greater than 40% w/w and a C_{16} isomer content greater than 40% w/w. As the term is used in this disclosure a C_{16} alpha olefin fraction (also referred to as the C_{16} AO) is defined as having a C_{16} isomer content of greater than 90% w/w. As indicated in the table above the fluid may contain a mixture of isomers so long as the content of the other isomers does not exceed those of the isomers that define the fluid.

Please amend the paragraph beginning on page 13, line 16 and ending on page 14, line 2 (i.e. paragraph [0042]) as follows:

As the term is utilized in this disclosure, a three-component blend of hydrocarbons that are illustrative of the present invention comprises about 45% wt/wt to about 55% wt/wt of a C_{16}-C_{18} internal olefin fraction (internal olefin #1, C_{16-18} IO), about 20% wt/wt to about 30% wt/wt of a C_{15}-C_{18} internal olefin fraction (internal olefin #2, C_{15-18} 10), and about 20% wt/wt to about 30% wt/wt of a C_{15}-C_{16} internal olefin fraction (internal olefin #3, C_{15-16} IO). A preferred blend comprises about 47% wt/wt to about 53% wt/wt internal olefin #1 (C_{16-18} IO), about 22% wt/wt to about 28% wt/wt internal olefin #2 (C_{15-18} IO), and about 22% wt/wt to about 28% wt/wt internal olefin #3 (C_{15-16} IO). A more preferred blend comprises about 50% wt/wt internal olefin #1 (C_{16-18} IO), about 25% wt/wt internal olefin #2 (C_{15-18} IO), and about 25% wt/wt internal olefin #3 (C_{15-16} IO).

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Please amend the paragraph beginning on page 31, line 4 and ending on page 32, line 21 (i.e. paragraph [0105]) as follows:

In view of the above disclosure, one of skill in the art should understand and appreciate that one illustrative embodiment of the present invention includes a first synthetic internal olefin fraction having from 16 to 18 carbon atoms (C_{16-18} IO), a second synthetic internal olefin fraction having between 15 to 18 carbon atoms (C_{15-18} IO), and a third synthetic internal olefin fraction having 15 to 16 carbon atoms (C_{15-16} IO). As the term is used in this disclosure a C_{16-18} IO is defined as having a C_{16} isomer content of greater than 50% w/w and a C_{18} isomer content greater than 30% w/w. As the term is used in this disclosure a C_{15-18} IO is defined as having a C_{15} isomer content of greater than 20% w/w; a C_{16} isomer content greater than 20%; a C_{17} isomer content greater than 20%; and a C_{18} isomer content greater than 15% w/w. As the term is used in this disclosure a C_{15-16} I0 is defined as having a C_{15} isomer content of greater than 40% w/w and a C_{16} isomer content greater than 40% w/w. As the term is used in this disclosure a C_{16} alpha olefin is defined as having a C_{16} isomer content of greater than 90% w/w. As indicated above the fluid may contain a mixture of isomers so long as the content of the other isomers does not exceed those of the isomers that define the fluid. The components of the illustrative wellbore fluid are blended such that the desired characteristics of toxicity and biodegrability are balance to achieve compliance with environmental requirements for hydrocarbon based drilling fluids. One such illustrative embodiment achieves this result by utilizing a formulation in which the first internal olefin is present in a range of about 40 to about 60 percent by weight of the wellbore fluid and wherein the second internal olefin is present in range of about 15 to about 40 percent by weight of the wellbore fluid and wherein the third olefin is present in range of about 10 to about 30 percent by weight of the wellbore fluid. Optionally, the illustrative fluid can include a C_{16} alpha olefin. In such instances, the C_{16} alpha olefin is present in the range of about 10 to about 20 percent by weight of the wellbore fluid. A person of skill in the art should understand and appreciate that the illustrative wellbore fluid may further include a non-oleaginous phase, typically as an internal phase. By doing so a non-aqueous drilling fluid is preferably formed. When included the non-oleaginous phase constitutes from about 1% to about 70% by volume of

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said fluid. Such a non-oleaginous phase may be selected from fresh water, seawater, a brine containing organic or inorganic dissolved salts, a liquid containing water-miscible organic compounds, and combinations thereof. The fluids of the present invention may further contain additional components depending upon the end use of the non-aqueous drilling fluid so long as they do not adversely impact the toxicity and biodegradability of the fluids or other permit considerations described herein. For example, alkali reserve, wetting agents, organophillic clays, viscosifiers, weighting agents, bridging agents and fluid loss control agents may be added to the fluid compositions of this invention for additional functional properties. The addition of such agents should be well known to one of skill in the art of formulating drilling fluids and muds. When included the weighting agent is selected from the group including calcium carbonate, dolomite, siderite, barite, celestite, iron oxides, manganese oxides, ulexite, carnalite, sodium chloride and combinations thereof and similar such weighting agents known in the art.

Please amend the paragraph beginning on page 32, line 22 and ending on page 33, line 14 (i.e. paragraph [0106]) as follows:

Alternatively, the present invention is considered to be a method of formulating the continuous phase of a hydrocarbon based drilling fluid. Specifically, in one illustrative core blend embodiment a first synthetic internal olefin fraction having from 16 to 18 carbon atoms (C_{16-18} IO), a second synthetic internal olefin fraction having between 15 to 18 carbon atoms (C_{15-18} IO), and a third synthetic internal olefin fraction having 15 to 16 carbon atoms (C_{15-16} IO) has been found to consistently meet the environmental standards for use in the Gulf of Mexico. This consistency of passing the toxicity and biodegradation tests provides a higher level of compliance assurance in contrast to the performance of the individual products which suffer greater variability due to testing artifacts and manufacturing inconsistencies. In another illustrative core blend embodiment, a first synthetic internal olefin fraction having from 16 to 18 carbon atoms (C_{16-18} IO), a second synthetic internal olefin fraction having between 15 to 18 carbon atoms (C_{15-18} IO), a third synthetic internal olefin fraction having 15 to 16 carbon atoms (C_{15-16} IO) and a C_{16} alpha olefin has been found to consistently meet the environmental standards for use in the

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Gulf of Mexico and Effluent Limitation Guidelines. This results in an oleaginous fluid having a balance of toxicity and biodegradability properties as well as meeting the PAH limitations required by the Effluent Limitation Guidelines and the general permits including GMG290000. Specifically, in the second illustrative core blend embodiment a mixture of a synthetic C_{16}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{18} internal olefin fraction; a synthetic C_{15}-C_{16} internal olefin fraction and a C_{16} alpha olefin has been found to consistently meet the environmental standards for use in the Gulf of Mexico. This consistency of passing the toxicity and biodegradation tests provides a higher level of compliance assurance in contrast to the performance of the individual products which suffer greater variability due to testing artifacts and manufacturing inconsistencies.

Please amend the paragraph beginning on page 33, line 15 and ending on page 33, line 24 (i.e. paragraph [0107]) as follows:

One of skill in the art should also appreciate and understand that the present invention includes as an illustrative embodiment a method of drilling a subterranean well Such an illustrative embodiment includes attaching a cutting bit to a length of drill pipe, rotating said cutting bit, removing cuttings from around said bit with a drilling fluid. The illustrative method utilizes a wellbore fluid as is substantially disclosed herein. In a preferred embodiment, the wellbore fluid includes a first synthetic internal olefin fraction having from 16 to 18 carbon atoms (C_{16-18} IO), a second synthetic internal olefin fraction having between 15 to 18 carbon atoms (C_{15-18} IO), and a third synthetic internal olefin fraction having 15 to 16 carbon atoms (C_{15-16} IO). Optionally the wellbore fluid may include an alpha olefin having 16 carbon atoms (C_{16} AO).

Please amend the Abstract as follows:

A method of formulating and the resulting biodegradable wellbore fluid includes a first synthetic internal olefin fraction having from 16 to 18 carbon atoms (C_{16-18} IO), a second

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synthetic internal olefin fraction having between 15 to 18 carbon atoms (C_{15-18} IO), and a third synthetic internal olefin fraction having 15 to 16 carbon atoms (C_{15-16} IO). The components of the wellbore fluid are blended such that the desired characteristics of polycyclic aromatic hydrocarbon content, toxicity and biodegrability are balance to achieve compliance with environmental requirements for hydrocarbon based drilling fluids. One such illustrative embodiment achieves this result by utilizing a formulation in which the first internal olefin fraction is present in a range of about 45 to about 55 percent by weight of the wellbore fluid and wherein the second internal olefin fraction is present in range of about 20 to about 30 percent by weight of the wellbore fluid and wherein the third olefin fraction is present in range of about 20 to about 30 percent by weight of the wellbore fluid. Optionally, the illustrative fluid can include a C_{16} alpha olefin (C_{16} AO). In such instances, the C_{16} alpha olefin (C_{16} AO) is present in the range of about 10 to about 20 percent by weight of the wellbore fluid.

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